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Application note AN-001:

Using Veracity Transmission Products with Mobotix Cameras

Summary

This application note explains the factors which must be considered when installing Mobotix cameras with Veracity's network transmission products, and how to plan installations or solve any problems that may be encountered.

The information given is also relevant for any Ethernet device that normally draws less PoE power than it requests, or whose network connection is not 100Base-T as standard. Veracity devices covered include the HIGHWIRE, CAMSWITCH and OUTREACH families.

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1 Background

Veracity's HIGHWIRE, CAMSWITCH and OUTREACH products have been especially designed to allow network infrastructure problems to be solved quickly and simply. They are compatible with the universal IEEE Ethernet and Power over Ethernet (PoE) standards, and incorporate features such as auto-negotiation and intelligent power management, to ensure straightforward installation.

However, in order to offer unique capabilities such as Ethernet-over-coax, universal low-voltage inputs, and PoE range extension, some restrictions must be placed on connected devices. Although this is never a concern for the majority of network applications, such as installations of conventional IP video cameras, there are some devices whose functionality demands less conventional interface configurations, and for these devices some extra consideration is required when planning an installation.

Mobotix cameras are the most frequently occurring examples of such devices. Unlike most IP cameras, they are highly integrated, incorporating video recording and analysis features and many optional external interfaces. As such, their network interface is set up to accommodate their worst-case configuration, demanding more PoE power than is usually necessary and often defaulting to the minimum Ethernet data rate.

The following two sections of this note explain the limitations this places on the use of Mobotix cameras with Veracity devices, and how to plan around them or solve any problems that may be seen on installation: Section 2 deals with PoE, and outlines the approaches that should be taken to ensure power is enabled to Mobotix cameras; while Section 3 describes the steps that should be taken to ensure a reliable network data connection between devices.

2 Enabling Power over Ethernet

In standard form, Mobotix cameras boast a very low power requirement of around 4 Watts. However, to allow for the demands of additions such as extra software or connected USB devices, they always request the maximum allowable PoE power from the network.

Whereas most fixed cameras would only request PoE power in *Class 1* (up to 4 Watts of power) or *Class 2* (7 Watts), Mobotix cameras are *Class 0*. This means that a PoE source, such as a PoE network switch, would refuse to switch on power to the camera unless it had a guaranteed 15 Watts available. (For a more detailed explanation of PoE Classes, please refer to Veracity's *PoE Explained* white paper).

For many conventional PoE sources, this is not a problem: they draw their power directly from the mains and are designed to be able to deliver 15 Watts to all of their channels at once. However, where power availability is restricted, such as when forwarding PoE, or when converting power from a low-voltage input, PoE delivery may have to be limited according to the Power Class of the connected device.

For Veracity's products, the following effects may be seen on connection of a Class 0 camera:

Product	**Symptoms**	**Explanation**
HIGHWIRE POE	PoE not enabled to camera	HIGHWIRE POE can only deliver 7 Watts so will only enable PoE to Class 1 or 2 devices
OUTREACH	PoE not enabled to camera, PoE Out LED blinking	OUTREACH cannot forward PoE to maximum-class devices when connected to a standard PoE source
HIGHWIRE QUAD CAMSWITCH QUAD	PoE only enabled to two cameras, flashing green LEDs on other connected ports	QUAD products have a maximum available power budget of 30 Watts, which is used up by two Class 0 cameras

There are two approaches that may be taken to adapt any installations that are constrained in this way by the cameras' Class 0 power requirement:

1. Treat each camera as a 15 Watt device when planning the installation. This is the technically-correct approach to take, and although the installation will appear over-designed for the apparent requirements of the cameras, it is guaranteed to cope with all upgrades to camera accessories or power-intensive software that are present or may be added.

2. Use an adaptor to make the camera request the appropriate power class. This simply involves the addition of a low-cost inline adaptor, which reduces the requested device power to a lower class, allowing an otherwise standard PoE installation. As long as the guidelines are followed, for the vast majority of installations this represents a simple and rapid solution.

Implementations of both solutions, for HIGHWIRE POE, OUTREACH, and HIGHWIRE QUAD or CAMSWITCH QUAD, are described in the next three parts of this section.

2.1 HIGHWIRE POE

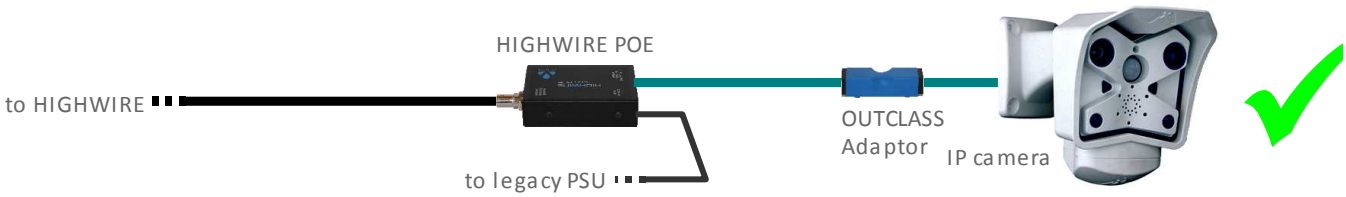
2.1.1 Desired configuration

In this application, a HIGHWIRE link is used to provide a digital network connection over legacy coaxial cable, and at the camera end a HIGHWIRE POE converts power from an available 12V DC or 24V AC supply to POE power for the Mobotix network camera. However, although the network camera only requires 4 Watts of power nominally, it requests 15 Watts of power from its PoE supply. As the HIGHWIRE POE is restricted to 7 Watts, no power can be enabled and the camera does not turn on.

2.1.2 Upgrading with HIGHWIRE QUAD

For the first approach, in order to allow for all possible configurations and camera loads of greater than 7 Watts, a HIGHWIRE QUAD is used in place of the HIGHWIRE POE as shown. The HIGHWIRE QUAD performs the same function as the original HIGHWIRE POE, but can deliver the extra power requested by the camera. It also facilitates an upgrade path for connection of other network devices or additional cameras, as long as sufficient power is available from the local supply.

2.1.3 Using an adaptor



Alternatively, if the camera's power requirement is known to be safely under 6 Watts, then the original setup can be modified with the addition of an OUTCLASS (Veracity's Class 2 PoE adaptor) before the camera. This solution is appropriate for the majority of applications where the camera is in a low-power configuration, although the installer must ensure this is the case. The adaptor appears as a Class 2 device, so the HIGHWIRE POE will cut off power to the camera if it exceeds 7 Watts. *A Mobotix M12 camera running standard software and with no CamIO board fitted draws at most 4.5 Watts.*

2.2 OUTREACH

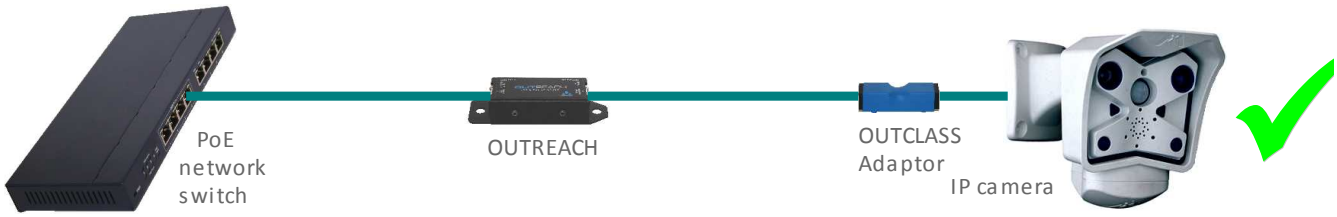
2.2.1 Desired configuration

In the application shown above, a Mobotix camera must be located more than 100 metres from a PoE network switch, so an OUTREACH is used to extend the connection. However there is not enough power available from the switch for both the OUTREACH and the maximum class requested by the camera, so OUTREACH's intelligent power management will not permit PoE forwarding.

2.2.2 Upgrading with OUTSOURCE

To allow the Mobotix camera to be treated as a maximum-class device, the link can simply be upgraded with a Veracity OUTSOURCE as shown. OUTSOURCE is a standard PoE injector, but can deliver the extra power that OUTREACH needs to enable both itself and the Class 0 camera. There is also enough overhead to fit a second OUTREACH and extend range beyond 200 metres. This also frees PoE ports in the switch, and multi-port and rack-mount OUTSOURCEs are available.

2.2.3 Using an adaptor

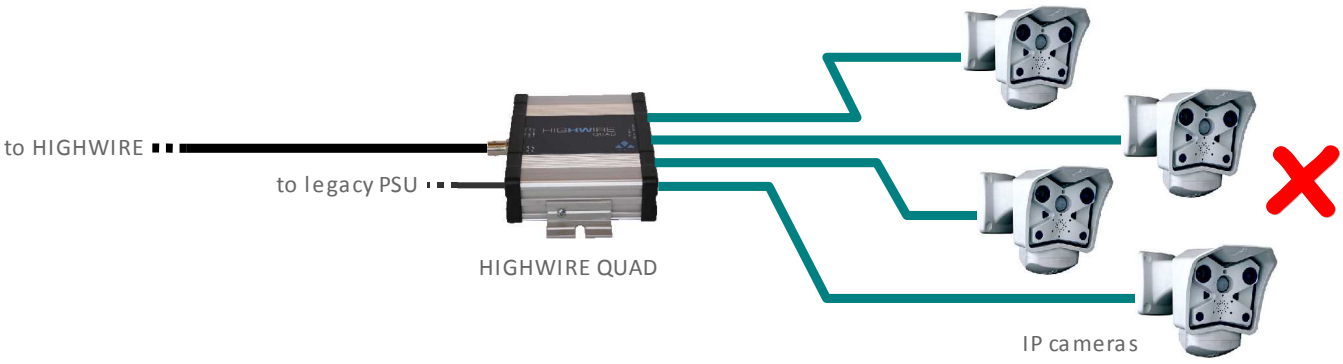


It is also possible to use OUTCLASS to make the Mobotix camera appear as a Class 2 PoE device, shown in this diagram. Again this is only recommended for Mobotix cameras in basic, low-power configurations, although there is more overhead in this case. As long as the camera's maximum power remains below 6 Watts then extension to 300 metres with two OUTREACHes is possible.

2.3 HIGHWIRE QUAD and CAMSWITCH QUAD

These two products have similar PoE characteristics, so HIGHWIRE QUAD will be used in the examples.

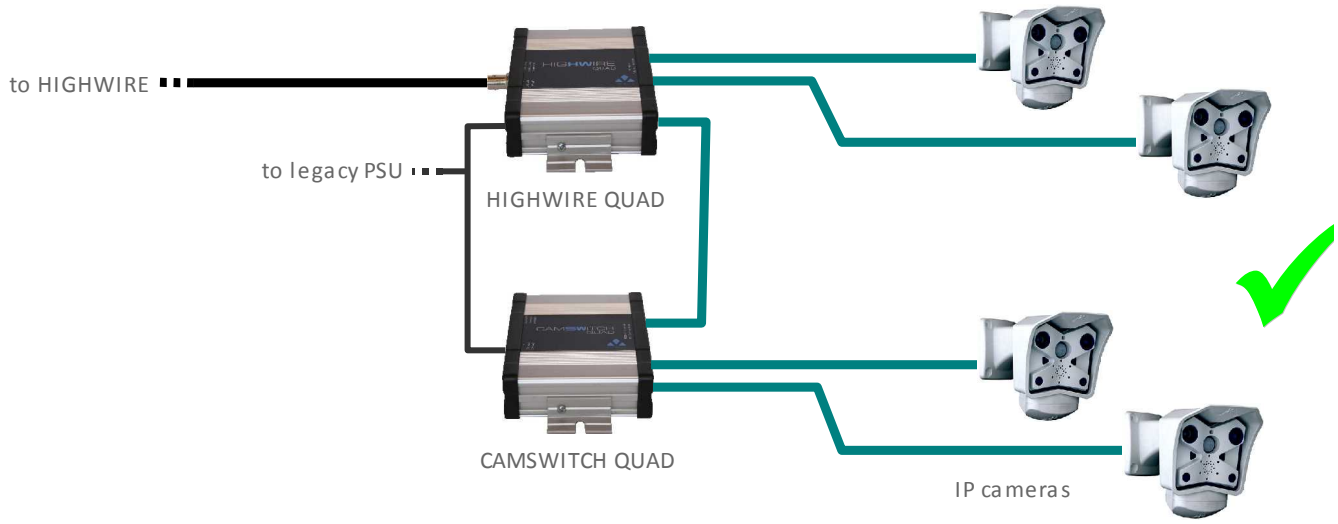
2.3.1 Desired configuration



The first diagram shows a typical installation where a legacy coaxial cable has been upgraded to digital using HIGHWIRE, with a HIGHWIRE QUAD converting local power to PoE for four Mobotix cameras.

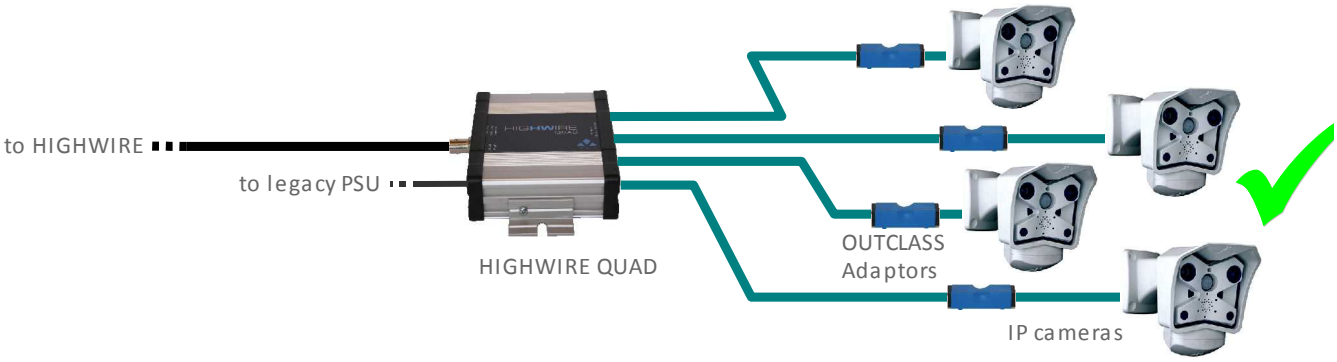
The HIGHWIRE QUAD has an available power budget of 30 Watts, enough for four conventional 6 Watt cameras, but as each camera is requesting 15 Watts of power, only two can be enabled.

2.3.2 Upgrading with an additional CAMSWITCH QUAD



A configuration which ensures the correct 15 Watts is available for each camera is shown above. The CAMSWITCH QUAD converts an additional 30 Watts of power from the local low voltage supply, allowing two further cameras to be enabled. This configuration also leaves 3 non-PoE ports spare for expansion.

2.3.3 Using adaptors



OUTCLASS adaptors can also be used for Mobotix cameras in this case. HIGHWIRE QUAD and CAMSWITCH QUAD do provide over-current protection, cutting power if the total or per-channel power budget is exceeded, however as before the strict rule for reliable operation is that the cameras fitted are in their standard configuration with no CamIO board or peripherals fitted.

3 Configuring the Network Interface

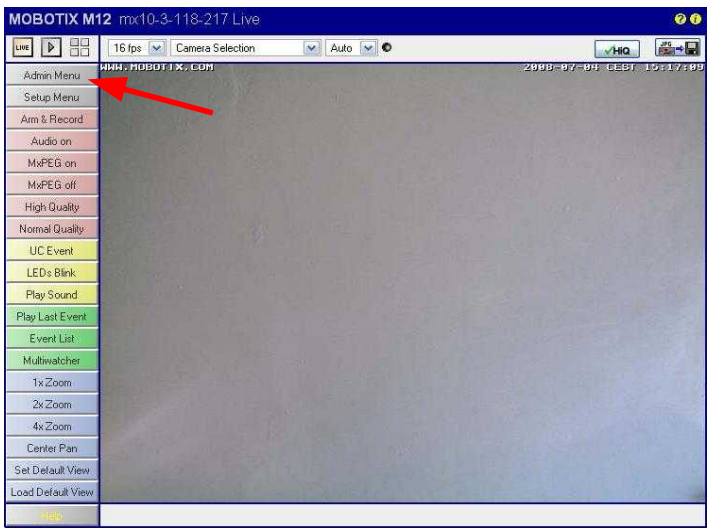
Mobotix cameras are compatible with both the 10Base-T and 100Base-T Ethernet standards, but do not require a high bandwidth, so are often configured for 10Base-T half-duplex only by default. When this is the case, the following symptoms may be seen on connection to Veracity products:

Product	Symptoms	Explanation
HIGHWIRE HIGHWIRE POE	Dropped packets, frozen images	Rate mismatch end-to-end. HIGHWIRE automatically connects at the highest available rate and duplex at both ends.
OUTREACH	No network connection, network link LEDs not light	Connection not possible. OUTREACH only permits connection at 100Base-T full-duplex, to prevent mismatches and collisions.
HIGHWIRE QUAD CAMSWITCH QUAD	None, camera connects fine	QUAD products have full 10/100 switch functionality so no packets are lost. However upgrading to 100Base-T is still advised.

These can all be remedied by enabling 100Base-T operation as described below. (However if the camera is not receiving power, please refer to section 2 first.)

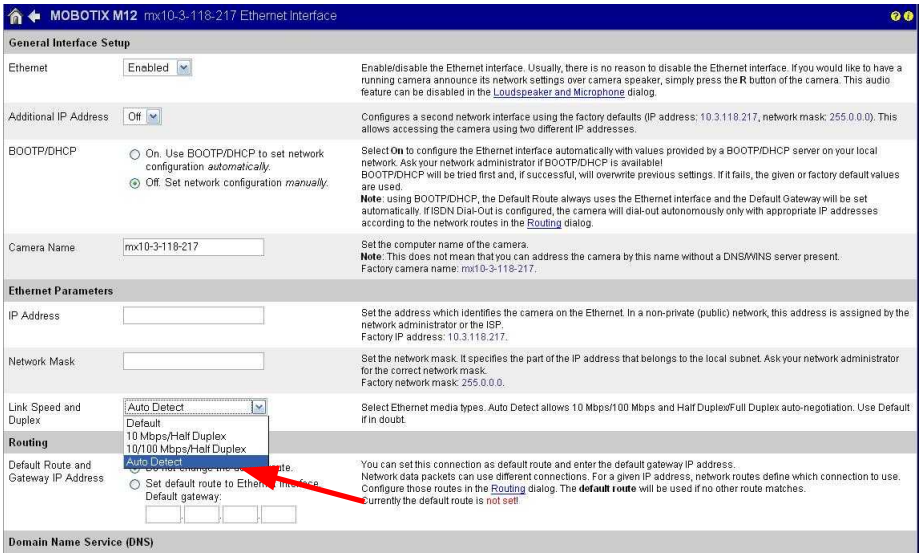
1. Connect the camera to a PC, via a PoE power supply such as a network switch

2. Open the camera in a web browser. You may need to disable your firewall and set a new IP address for your PC as described in your camera's user manual



3. Select the *Admin Menu* as shown, and log in. (The factory default login is *admin*, with password *meinsm.* Follow the *Quick installation* if required.)

4. Select *Ethernet Interface* as shown below. Alternatively, browse to: *http://10.x.x.x/admin/etherconfig*


MOBOTIX M12 mx10-3-118-217 Ethernet Interface
General Interface Setup
Ethernet
Enabled
Enable/disable the Ethernet interface. Usually, there is no reason to disable the Ethernet interface. If you would like to have a running camera announce its network settings over camera speaker, simply press the R button of the camera. This audio feature can be disabled in the Loudspeaker and Microphone dialog.
Additional IP Address
Off
Configures a second network interface using the factory defaults (IP address: 10.3.118.217, network mask: 255.0.0.0). This allows accessing the camera using two different IP addresses.
BOOTP/DHCP
On. Use BOOTP/DHCP to set network configuration automatically.
Off. Set network configuration manually.
Select On to configure the Ethernet interface automatically with values provided by a BOOTP/DHCP server on your local network. Ask your network administrator if BOOTP/DHCP is available!
BOOTP/DHCP will be tried first and, if successful, will overwrite previous settings. If it fails, the given or factory default values are used.
Note: using BOOTP/DHCP, the Default Route always uses the Ethernet interface and the Default Gateway will be set automatically. If ISDN Dial-Out is configured, the camera will dial-out autonomously only with appropriate IP addresses according to the network routes in the Routing dialog.
Camera Name
mx10-3-118-217
Set the computer name of the camera.
Note: This does not mean that you can address the camera by this name without a DNS/WINS server present.
Factory camera name: mx10-3-118-217.
Ethernet Parameters
IP Address
Set the address which identifies the camera on the Ethernet. In a non-private (public) network, this address is assigned by the network administrator or the ISP.
Factory IP address: 10.3.118.217.
Network Mask
Set the network mask. It specifies the part of the IP address that belongs to the local subnet. Ask your network administrator for the correct network mask.
Factory network mask: 255.0.0.0.
Link Speed and Duplex
Auto Detect
Default
10 Mbps/Half Duplex
10/100 Mbps/Half Duplex
Auto Detect
Select Ethernet media types. Auto Detect allows 10 Mbps/100 Mbps and Half Duplex/Full Duplex auto-negotiation. Use Default if in doubt.
Routing
Default Route and Gateway IP Address
Set default route to Ethernet interface
Default gateway:
You can set this connection as default route and enter the default gateway IP address.
Network data packets can use different connections. For a given IP address, network routes define which connection to use. Configure those routes in the Routing dialog. The default route will be used if no other route matches.
Currently the default route is not set!
Domain Name Service (DNS)

5. In the *Ethernet Parameters* section, change *Link Speed and Duplex* from *Default* to *Auto Detect*

6. Scroll to the bottom of the screen, click *Set,* then click *Close,* and *OK* to agree to the changes in the flash memory

7. Close the browser and disconnect the camera.

The next time the camera is powered up, it will automatically connect at 100Base-T full duplex, or at the highest rate available. It is now optimised for use with Veracity's network products.